

September Mixed Waste Subgroup Highlights

The Hanford STCG Mixed Waste Subgroup met on September 10, 1998 in the EESB Chinook Room. Gary Smith, PNNL, gave a viewgraph presentation on Sol-gel stabilization work he is performing for the MWFA. He is working with researchers at the University of Arizona also. The MWFA has determined there is a problem stabilizing mixed wastes with salt contents greater than 10%. In addition, current techniques have limited success in stabilizing solid and sludge salt wastes containing RCRA metals. The objective of this research is to develop a sol-gel based, low-temperature processing route to fabricate waste forms incorporating high concentrations of salt waste. These waste forms have to meet several targets, including TCLP for hazardous metals, compressive strength of >60 psi, and a leachability index of ≥ 6.0 for salt components. Salt wastes across the DOE complex include chlorides, nitrates, and sulfates contaminated with toxic metals, hazardous organics, and radioactive elements. The salt wastes are byproducts of vitrification and chemical processing operations and are highly soluble, easily hydrated, reactive and mobile. The MWFA recommended two salt waste surrogates which represent the diverse nature of salt wastes across the complex. One was a chloride-based surrogate with a salt content of 19%, and the second was a nitrate-based surrogate with a 62% salt content. Each of these also contained toxic metal and hazardous organic contaminants.

Sol-gel synthesis is a wet chemical technique to produce solid encapsulating matrices. The reaction objective is to create a 3-D network of covalent bonds at low temperatures through hydrolysis and condensation reactions. The advantages of sol-gel processing include low processing temperatures, chemical homogeneity or controlled heterogeneity, novel phases/compositions, processing flexibility, the ability to tailor microstructures, and the ability to accommodate large volumes of second phase materials. Substances called polycerams are combined with the salt waste surrogates and put through the sol-gel processing route to allow molecular scale combinations. Polycerams are a combination of ceramics that are hard and strong and polymers that are flexible, deformable, and tough. The result is a material with properties that lie between those of the end members materials. A side-modified polybutadiene-based polyceram was combined with the salt waste surrogates to produce waste forms that were then subjected to the TCLP, strength, and leachability tests. The polyceram waste forms maintained their mechanical integrity, prevented the leaching of toxic metal components, and reduced the leaching of salt ions to very low levels. Thus, the polyceram waste forms provide easy and flexible means to dispose of salt wastes.

Gary said he has been working with Don Flyckt at the 200 Area Liquid Effluent Treatment Facility (LETf) on dealing with salt wastes in concentrated brines. Norm Olson said there is a need to determine the costs of the various options versus the current baseline. It may be best to get a group of vendors together to work out a solution. Gary stated that he is putting together a

proposal to deal with the LETF problem. He is working with Don Flyckt on the proposal to be sent to the MWFA for funding. Half the funding would come from the MWFA and the other half from the LETF program. Norm said the contractors need to determine the requirements before proceeding with funding the proposal.

Gary Josephson, PNNL, gave a viewgraph presentation on the glow discharge process (GDP) for the destruction of organics. Gary compared the glow discharge to plasma and corona discharge and reviewed the test apparatus used to run the experiments in the lab. One organic tested was Pentachlorophenol (PCP), which is an oxidizable, non-volatile compound of Superfund concern. There is data available on alternative technologies that also destroy PCP. Gary presented graphs on the PCP kinetics and of PCP destruction versus power cost. The second organic compound tested was perchloroethylene (PCE), which is not very oxidizable and is of concern to DOE and Superfund. Gary showed graphs that detailed the PCE destruction over time when PCE was in air, argon, and hydrogen. The best results, complete and fast, were achieved in hydrogen. Gary then presented schematics showing the scale-up of the process to a continuous reactor. The heart of the process is a falling film glow discharge process reactor. Gary also showed photos of the reactor in operation, as well as the results of PCP destruction in the reactor. In summary, the GDP is a versatile process and treatment technology. Using AC current with dielectrics the GDP can be scaled up to commercial volumes. Gary stated that he is now searching for problems to use the GDP to solve. It could be used to treat sludges without precipitation beforehand.

Norm Olson and Larbi Bounini visited LLNL recently and returned with information on two new technologies that LLNL is developing. Information on both was distributed to the subgroup. The direct chemical oxidation (DCO) of organic waste uses aqueous peroxydisulfate, which is a very powerful oxidizing agent. LLNL has developed a sequential, continuously stirred, constant-temperature reactor process to treat highly toxic or radioactive-contaminated organic wastes. A test using hydraulic fluids contaminated with PCBs is now underway. Results to date are now being analyzed. LLNL is looking for industrial partners to take DCO commercial. LLNL is also testing the molten-salt oxidation (MSO) of wastes. This is an alternative to incineration for hazardous, mixed, medical, and other types of waste. A demonstration of MSO will take place at LLNL next Friday in a pilot-scale reactor system.

While Norm and Larbi were in California they visited Lasertronics in Milpitas. Lasertronics has developed laser cleaning systems that can remove hard coatings and clean up pitted and non-porous surfaces. Norm will send me handouts he received at Lasertronics and I will get copies to all subgroup members. Lasertronics says their system can remove the TRU from the surface of gloveboxes. You need a vacuum system at the surface to remove the TRU after it is lasered off. There are plans to send a hot glovebox to Lasertronics so they can test their system.

Wayne Ross said he received a call from a company selling a product called ducrete. It is a concrete made with uranium oxide chips mixed in. It can be used to make a shielded box for shipments of RH waste. These ducrete boxes would be cheaper than the steel boxes being used. Information on ducrete needs to be sent to the generators of waste to see if there is any interest in using these boxes.

There has been no word received on the ASTD proposals that were sent in to DOE. The MWFA has said they have set aside \$450K to help deal with the problem of characterizing our long-length equipment. There has been no recent contact from the MWFA. It was suggested that a trip to Idaho be taken soon to find out what is happening in the MWFA.

The next STCG MW Subgroup meeting is October 8 at 1:00pm in the ETB Wenatchee River Room.

Mixed Waste Subgroup Meeting Attendees - 6/11/98

Ted Anderson	BHI	372-9343
Gary Ballew	PREC	946-0611
Bill Bonner	PNNL	372-6263
Larbi Bounini	WMH	376-4650
Ellen Dagan	DOE-RL	376-3811
Don Engelman	NHC/FDH-TM	372-6536
Pamela Innis	EPA	376-4919
Gary Josephson	PNNL	376-4325
Ja-Kael Luey	PNNL	376-5740
Norm Olson	FDH-TM	372-4810
Wayne Ross	PNNL	372-4684
Gary Smith	PNNL	373-6155
Steve Weakley	PNNL	372-4275